Feb. 8, 1955 S. J. HAMLETT 2,701,694

THREAD TENSION DEVICE FOR SEWING MACHINES

Filed March 20, 1952 2 Sheets-Sheet 1

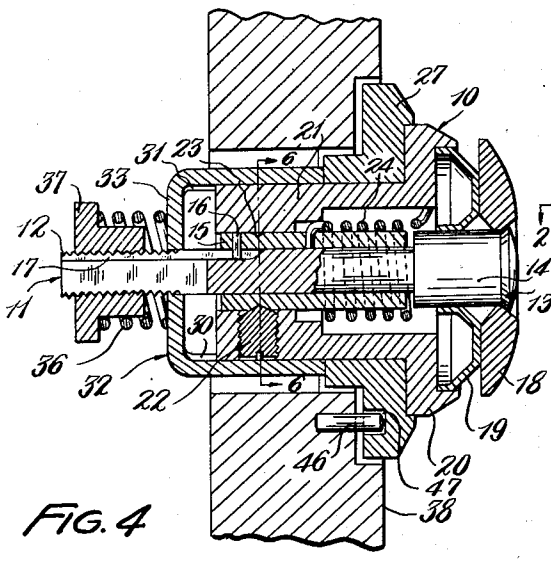


FIG. 4

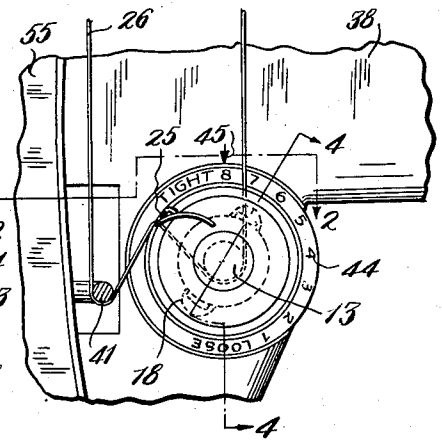


FIG. 1

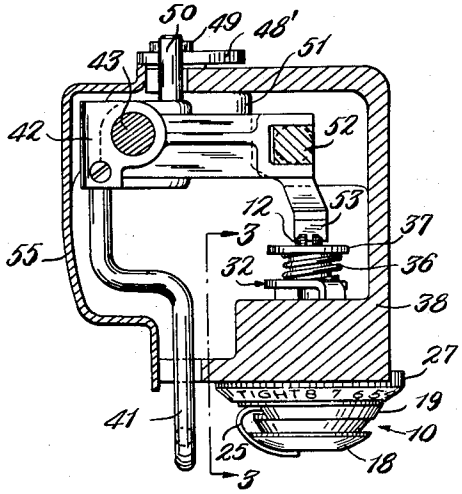


FIG. 2

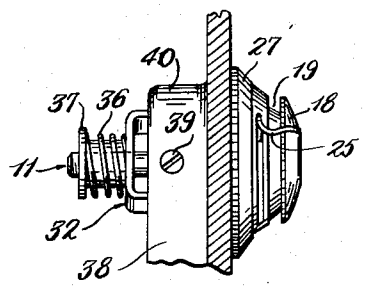


FIG. 3

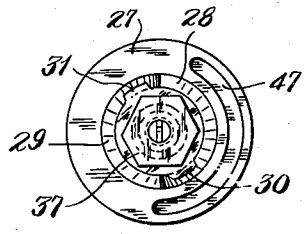


FIG. 5

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THREAD TENSION DEVICE FOR SEWING MACHINES

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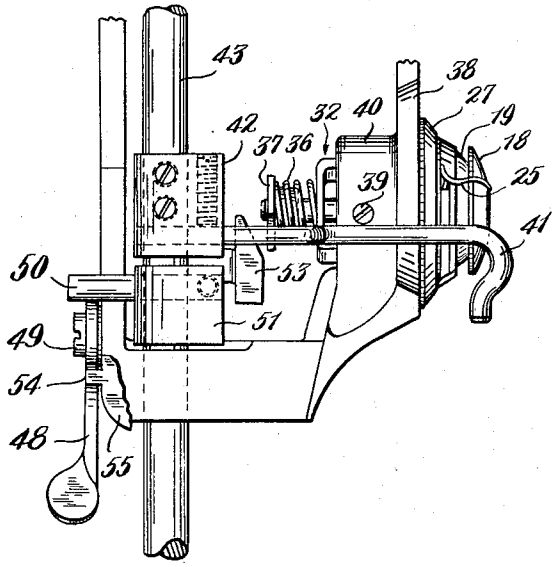


FIG. 8

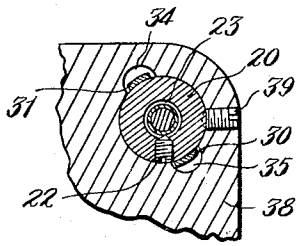


FIG. 6

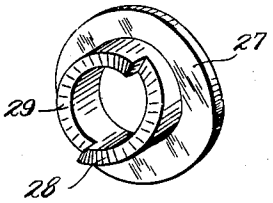


FIG. 7

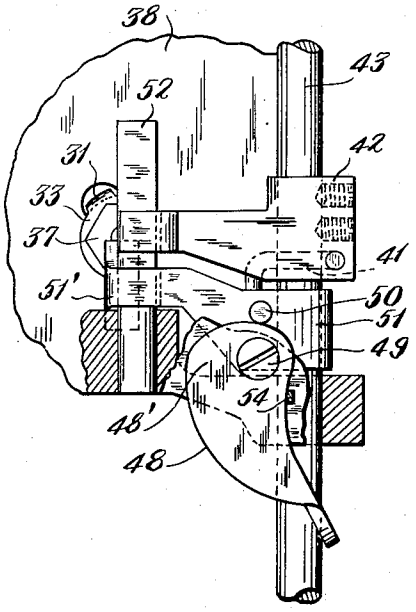


FIG. 9

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THREAD TENSION DEVICE FOR SEWING MACHINES

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Application March 20, 1952, Serial No. 277,621

12 Claims. (Cl. 242—150)

This invention relates to thread tensioning devices and, more particularly, to a mechanism for use on a sewing machine to subject the thread utilized therein to a preselected tension which may be readily varied.

The principal object of the invention is to provide an improved means for tensioning the thread in a sewing machine, which means is economical to manufacture, easily installed, reliable in action, and easily adjusted by the user to provide a wide range of thread tensions.

A more specific object of the invention is to provide an improved means for tensioning the thread of a sewing machine such that any desired thread tension within a wide range of values thereof can be secured by rotation of a single member through less than one revolution, the preselected tension being reliably maintained against unwanted variations during sewing operations.

A still more specific object of the invention is to provide an improved device for tensioning the thread of a sewing machine by means of a spring and abutting members aligned with the tensioning disk-like members between which the thread passes, the pressure on the thread, and hence the tension thereof, being varied by at least one of the interengaging surfaces of the abutting members having an axially directed cam portion so that partial rotation thereof provides a complete range of desired thread tensions.

Another object of the invention is to provide an improved thread tensioning device as defined above with a means for releasing the preselected thread tension upon elevation of the presser foot bar of the sewing machine without altering the angular position of the rotatable tension adjusting member so that restoration of the presser foot bar to its lower position reestablishes the preselected tension on the thread.

The invention further resides in certain novel features of the construction and arrangement of the parts of the mechanism, and further objects and advantages of the invention will be apparent to those skilled in the art to which it pertains from the following description of the present preferred embodiment thereof, which is described with reference to the accompanying drawings in which:

Fig. 1 is a front elevational view of the present preferred embodiment of the invention showing the manner in which it is applied to a sewing machine head, only a portion of the latter being illustrated;

Fig. 2 is a transverse sectional view taken substantially on the irregular line 2—2 of Fig. 1 with certain conventional portions of the sewing machine omitted;

Fig. 3 is a fragmentary sectional view taken substantially on the line 3—3 of Fig. 2;

Fig. 4 is an enlarged view in section through the device, the view being taken substantially on the line 4—4 of Fig. 1;

Fig. 5 is a rear elevational view of the tensioning device per se removed from the sewing machine head;

Fig. 6 is a fragmentary sectional view through the mechanism, the view being taken substantially on the line 6—6 of Fig. 4 but to a smaller scale;

Fig. 7 is a detached perspective view of the rotatable tension adjusting member of the mechanism showing the annular cam surface thereon;

Fig. 8 is a side elevational view of the structure shown in Fig. 2 as seen from the left-hand side of that figure with the principal portion of the side housing cover or plate broken away; and

Fig. 9 is an enlarged rear view of the mechanism shown

in Fig. 8 with portions of the sewing machine head broken away to more clearly reveal the operating parts.

Referring first to Fig. 4 of the drawings, it will be seen that the present preferred embodiment of the tensioning mechanism, which is generally designated 10, comprises a central support in the form of a shaft or stud 11, the rear end 12 of which is threaded while the forward end is provided with a head 13 and cylindrical shoulder portion 14. Rearwardly of the cylindrical portion 14 and intermediate it and the threaded portion 12, the shank of the support or stud 11 is cylindrical and preferably has a diameter substantially equal to the outside diameter of the threads 12. On this shank portion of the support or stud 11 is disposed a sleeve 15 which is prevented from rotation relative to the stud or shaft 11 by means of a pin 16 secured in the sleeve and extending into a milled groove 17 in the stud 11.

The cylindrical portion 14 of the shaft or stud 11 is provided with a pair of cooperating disk-like members 18, 19 between which the thread, which is to be tensioned, passes. These disk-like members may be variously constructed, but the member 18 is here shown as a solid metal disk having a planar rear face and a convex forward face. The member 19 is preferably hollow for a purpose hereinafter described and hence is shown as formed of sheet metal with a planar forward face engaging the planar face of the member 18 but with the outer edge of this side of the member 19 tapering rearwardly to facilitate the entrance of thread between the members 18 and 19. The members 18, 19 are preferably freely rotatable upon the cylindrical portion 14 and at least the member 19 is slidable thereon.

The rear face of the disk-like member 19 is received in a circular recess provided in the forward face of an annular member 20 which has an axially extending cylindrical portion 21 supported upon the aforementioned sleeve 15 and releasably secured to the latter by means of a set screw 22, the point of which fits into a circumferentially extending groove 23 provided in the sleeve 15. The member 20 has an enlarged axial opening in the forward portion thereof providing a chamber between the disk-like member 19 and the portion of the member 20 which engages the sleeve 15. Within this chamber is disposed the coiled portion of an auxiliary tension spring 24 which has its inner end received in an opening in the sleeve 15 to prevent rotation of the spring relative to the sleeve and the stud 11. The outer end portion of the spring 24 extends through the hollow part of the disk-like member 19 and through a slotted opening in the side thereof as shown in Fig. 3 with this outer end portion of the spring bent, as shown in Figs. 1 and 3, to provide a loop 25 for receiving a portion of the sewing machine thread 26.

Journalled upon the forward part of the cylindrical portion of the member 20 is an annular member 27 which is rotatable for effecting adjustment of the tension on the thread 26 as will hereinafter be apparent. The forward face of this adjusting member 27 has a circular recess therein in which is received the rear face of the radial flanged portion of the member 20, see Fig. 4. The rear face of the member 27 has an axially extending portion, the outer surface of which is in the form of an annular cam inclined relative to the axis of the device. In the form of the mechanism here illustrated, the cam surface 28 is substantially helical and the total rise thereof is accomplished in a distance less than half the circumference, the surface being duplicated so that there are in effect two identical cam surfaces 28, 29 on the member 27, see Fig. 7. Engaged with the cam surfaces 28, 29 are axially extending portions 30, 31 of a member, generally designated 32, which has a transversely extending portion 33 slidably supported upon the shaft or stud 11.

The member 32 is normally held from rotation when the tensioning device is mounted in the head of the sewing machine by forming the portions 30 and 31 as elongated legs which are received in individual recesses or grooves 34, 35 in the head of the sewing machine. These recesses or grooves extend parallel to and communicate with the opening in which the main body of the tensioning device is mounted while the widths of these openings or recesses are only slightly greater than the widths of the

leg portions 30, 31 of the member 32, see Fig. 6. The forward ends of the portions or legs 30, 31 engage with the aforementioned cam surfaces 28, 29 on the member 27 and preferably are provided with cam surfaces complementary to the surfaces 28, 29 for sliding cooperation therewith. The members 27 and 32 are held in engagement by a coiled compression spring 36 disposed about the shaft or stud 11 rearwardly of the member 32 and intermediate the latter and a nut 37 which is screwed upon the threaded end of the stud. The nut 37 is preferably held in any predetermined position by the locking action of the threads 12 of the stud, which locking action is effected in the illustrated embodiment by slotting the outer end of the support or stud 11 and slightly separating the two portions adjacent the end thereof as will be readily understood.

In employing the apparatus as thus far described, the mechanism is assembled as shown in Fig. 4 and inserted in the prepared opening in the head 38 of the sewing machine so that the legs 30, 31 of the member 32 are disposed within the openings 34, 35 and the member 27 is received, with a slight clearance, within a recess in the forward face of the head. The mechanism is secured in this position by means of a set screw 39 threaded through the side of an integral boss 40 of the head 38, the point of the set screw being received in a recess in the side of the member 20 intermediate the legs 30, 31 of the member 32, see Fig. 6. The thread 26 to be used in the sewing machine is led through the usual guides, not shown, to and between the disk-like member 18, 19, thence about the loop 25 of the auxiliary spring 24 and about a forwardly projecting thread guide 41 which is carried by a block 42 secured to the presser foot bar 43 of the machine, see Fig. 1. The thread 26 is then led through the usual thread takeup and thread guides to the needle in the manner which is well understood and hence is not illustrated.

As thus disposed, the thread 26 will be placed under a predetermined tension due to the pressure exerted between the members 18 and 19 by virtue of the coiled spring 36 tending to move the shaft or stud 11 rearwardly, it being remembered that the assembly is held from axial movement as a whole with respect to the opening in the machine head by means of the set screw 39. The position of the nut 37 is initially adjusted before assembly of the device to provide a predetermined minimum tension when the adjusting member 27 is disposed so that the legs 30, 31 engage the lowest portion or minimum positions of the cam surfaces 28, 29. This adjustment, which may be made at the factory or by a serviceman, is normally not varied and is maintained by the abovementioned locking action of the slotted end of the stud 11 which expands the threads thereof into gripping engagement with the threads of the nut 37.

The tension upon the thread 26 passing between the members 18, 19 may be varied through the desired range of values by the operator simply turning the member 27 through a portion of a revolution, which in the illustrated embodiment is slightly less than half a complete revolution. The adjusted position of the member 27 and hence the resulting tension on the thread may be visually indicated by suitable indicia 44 upon the flange of the member 27 which cooperate with a reference arrow or indicium 45 on the head of the machine. Turning of the adjusting member 27 is facilitated by virtue of the fact that it is positioned adjacent a side face of the sewing machine head 38 with the flange of the member 27 extending slightly beyond the head, as is clearly shown in Fig. 1, so that the edge of this flange may be easily engaged by a finger of the operator. Adjustment may be further facilitated by milling, chasing or knurling the outer edge of the flange, if desired. The rotation of the member 27 is preferably positively limited within the arcuate extent of the cam surfaces 28, 29 by suitable limiting means as, for example, by a stop pin such as 46 mounted in the head of the sewing machine and fitting within an arcuate recess 47 on the rear surface of the adjusting member 27.

It will be evident, therefore, that by this mechanism a wide range of thread tensions may be easily secured through manipulation of the member 27 a distance of less than one-half a revolution, which tension is maintained during operation of the machine without variation, since the interengaging cam surfaces on members 27 and 32 are so disposed that vibration of the machine does not tend to cause relative movement therebetween. The tension upon the thread is further augmented by the spring 24 and the extent of this tension is normally adjusted prior to assembling the device by angular positioning the sleeve 15 relative to the member 20 and then clamping these parts in their adjusted positions by means of the screw 22.

The conventional presser foot bar 43 of the sewing machine is provided at its lower end with the usual presser foot, not here shown, which is adapted to be elevated when the material to be sewed is being positioned beneath the needle. In accordance with this invention, the mechanism for effecting elevation of the presser foot bar also effects an axial thrust upon the shaft or stud 11 in the direction releasing the tension upon the thread 26 passing between. In addition, the thread guide 41 is also elevated. These operations are effected by a manually operable member 48 which is pivotably secured to the rear portion of the machine head, as by means of a screw 49, and has a cam surface 48' engaging a rearwardly extending pin 50 provided on a bracket member 51 that is carried by the presser foot bar 43. The bracket member 51 has a laterally extending portion 51' which has a substantially rectangular opening slidably engaged upon a vertically extending guide bar 52 carried by the machine head 38. Extending forwardly from the portion 51' of the bracket 51 is an arm the outer end of which is provided with a vertically inclined cam member 53 positioned adjacent the rear end of the stud or support 11, see Figs. 2 and 8.

It will be apparent, therefore, that upon rocking of the member 48 in a clockwise direction, as viewed in Fig. 9, the cam surface 48' engages the pin 50 thereby elevating the bracket 51 and the presser foot bar so that the presser foot is raised from the work. Likewise, the bracket 42 which is connected with the presser foot bar 43 is also elevated so that the thread guide 41 is correspondingly lifted. The elevation of the bracket 51 also raises the cam 53 so that the inclined surface of the latter engages the end of the stud 11, forcing the latter forwardly against the action of the spring 36 so that the pressure between the members 18 and 19 is released.

When the presser foot is to be restored to its initial position the member 48 is returned to a position substantially as shown in Fig. 9 and which is determined by a stop 54 provided upon the removable end cover or plate 55 for the head. Restoration of the member 48 causes lowering of the presser foot bar under the action of the conventional spring, not shown, thereby lowering the thread guide 41 to its position as shown in Fig. 1 and moving the cam 53 from engagement with the stud or support 11 so that the spring 36 returns the parts to their initial positions shown in Fig. 4. Consequently, the predetermined tension upon the thread is restored. Since the member 32 is held from rotation and the tension release is effected solely by an axial movement of the stud 11, the preselected tension as determined by the setting of the adjusting member 27 is not altered by repeated elevation and lowering of the presser foot bar during use of the apparatus. The tension upon the thread may, however, be readily varied as aforementioned by simply turning the adjusting member 27 to place the indicium corresponding with the desired tension in alignment with the arrow 45.

It will now be apparent that this invention provides an improved thread tensioning means for a sewing machine which is compact, easily manufactured and installed, and which may be readily adjusted by the machine operator without the need of special tools. Moreover, the entire range of thread tensions, which is equal to or greater than that provided by conventional devices is now achieved through rotation of the adjusting member 27 a distance of less than half a revolution. Furthermore, this adjustment may be effected by a single finger of the operator, this being due both to the novel construction of the mechanism and its convenient location upon the head of the machine. It will also now be evident that the novel mechanism provides for release of the thread tension upon elevation of the presser foot and restoration of the preselected tension without variation thereof when the presser foot is again lowered.

Although certain specific constructional details have been herein illustrated and described as incorporated in

the preferred embodiment, it will be apparent that variations may be made without departing from the principles of the invention. For example, it is not essential that the normally stationary member **32** be in the form as here shown with two spaced legs, but may be provided with only one such leg or may be in the form of a continuous annular surface complementary with the surface on the adjusting member **27**. In the latter construction suitable means such as a set screw or the like could be employed to prevent rotation of the member **32**. It will also be apparent that, while the disk-like thread tensioning member **18** has been shown as separate from the head **13** of the stud or shaft, this member may in some instances be simply the enlarged head of the central supporting stud or shaft **11**. These and other modifications and adaptations of the apparatus will be readily apparent to those skilled in the art and consequently the invention is not to be considered as limited to the details of the construction here specifically disclosed except as may be required by the spirit and scope of the appended claims.

Having thus described the invention, I claim:

1. A thread tensioning device mounted on a support comprising a stud having a head at its forward end and having the outer end of its shank threaded with an unthreaded portion between, a disk on the unthreaded portion of the shank engaging said head, a second disk on said unthreaded portion of said stud in engagement with the first disk and adapted to exert force on a thread passing between said disks, a sleeve surrounding a portion of the shank of said stud and held from rotation relative thereto, a spring wire having one end portion coiled about said sleeve and secured thereto with the other portion extending outwardly therefrom and provided with an offset portion for receiving the thread passing between said disks, an annular member surrounding said sleeve and coiled portion of said wire and having a portion engaging said second disk, means securing said member to said sleeve, means releasably securing said member to said support, an annular adjusting member rotatably supported upon the first mentioned annular member and having a cam surface on its rearward end, a member supported on said stud rearwardly of said sleeve and held from rotation relative to said support, the last-mentioned member having an inclined cam surface complementary to the first-mentioned cam surface and abuttingly engaged therewith, a nut on the threaded portion of said stud, and a compression spring surrounding the shank of said stud intermediate said nut and the last-mentioned member creating pressure between said disks, whereby the pressure between said disks and hence the tension on a thread passing therebetween may be varied by turning said adjustable annular member.

2. A thread tensioning device as defined in claim 1 and wherein the total rise of said cam surfaces occupies less than one-half the circumference of said annular adjusting member and means are provided to limit the extent of rotation of said annular adjusting member to less than one-half revolution.

3. A thread tensioning device as defined in claim 2 wherein the said annular adjusting member has a radial flange a portion of which extends beyond the side wall of the support on which it is mounted thereby facilitating actuation thereof by the machine operator.

4. In a support having an opening therein, a thread tensioning device comprising a stud, a pair of disk-like members on said stud adjacent one end of the latter and adapted to receive thread therebetween, at least one of said members being axially slidable on said stud, abutment means on said stud adjacent the other end thereof, a pair of cooperating members supported on said stud between said abutment means and said disk-like members in a manner permitting axial movement between said stud and said cooperating members, one of said cooperating members being rotatable relative to said stud and having the end face thereof adjacent the other of said cooperating members provided with portions of different axial extents forming cam surfaces, the other of said cooperating members having circumferentially spaced portions extending axially of said stud parallel with the axis of the stud and with the ends of said portions engaging the said cam surfaces, a compression spring on said stud between said abutment means and the said other member urging the said disk-like members together and the said cooperating members into engagement, and means removably securing the tensioning device in said opening in said support with the sides of the axially extending portions on the said other member engaging portions of the support to prevent rotation of said member, whereby the pressure between the disk-like members and hence the tension on a thread passing therebetween is adjustable by rotation of the said one cooperating member.

5. A thread tensioning device as defined in claim 4 and further comprising a spring wire with one end portion coiled concentrically with respect to said stud and positioned within the confines of the axially extending portions of the said other of the cooperating members with a part of said spring wire extending outwardly therefrom and from said support and having an offset portion for receiving the thread passing between the disk-like members.

6. In a support with an opening therein, a thread tensioning device comprising a stud, a pair of disk-like members on said stud adjacent one end of the latter and adapted to receive thread therebetween, at least one of said members being axially slidable on said stud, abutment means on said stud adjacent the other end thereof, a pair of cooperating members supported on said stud between said abutment means and said disk-like members in a manner permitting axial movement between said stud and said cooperating members, one of said cooperating members being rotatable relative to said stud and having the end face thereof adjacent the other of said cooperating members provided with portions of different axial extents forming cam surfaces, the other of said cooperating members having circumferentially spaced axially extending legs the ends of which engage the said cam surfaces, a compression spring on said stud between said abutment means and the said other member urging the said disk-like members together and the said cooperating members into engagement, and means removably securing the tensioning device in said opening of said support with a portion of said one of the cooperating members accessible externally thereof and with the sides of the legs on the said other member engaging portions of the support to prevent rotation of said member, whereby the pressure between the disk-like members and hence the tension on a thread passing therebetween is adjustable by rotation of the said one cooperating member.

7. A thread tensioning device as defined in claim 6 and further comprising means to limit the extent of rotation of said one of the cooperating members to less than one-half revolution.

8. A thread tensioning device comprising a stud having a head at its forward end, support means nonrotatable relative to said stud and guiding said stud for axial movement, a first disk on the shank of said stud and engaged by its head, a second disk slidable on said stud between said first disk and said support means and adapted to engage said first disk to exert force on a thread passing between said disks, an annular adjusting member mounted on said support means coaxially therewith and with said stud for rotation about said stud and held by said support means against axial movement, the rearward end of said annular adjusting member containing a cam surface, the rise and fall of which is axial of said stud, a second member nonrotatably supported for axial movement relative to said stud and having a portion extending parallel with the axis of said stud with its forward end engaging said cam surface of said adjusting member, and a coiled spring engaging with abutment means on said stud and with said second member and exerting an axial force on said stud in a direction rearwardly of said support means, thereby engaging said disks together under springload, whereby the pressure between said disks and, hence, the tension of a thread passing therebetween can be adjusted by partial rotation of said annular member to increase or diminish the load exerted by said coil spring.

9. A thread tensioning device comprising a stud having a head at its forward end, support means nonrotatable relative to said stud, a first disk on the shank of said stud and engaged by its head, annular guide means nonrotatably supported by said support means for guiding axial movement of said stud and containing a bearing surface at its forward end, a second disk slidable on said stud between said first disk and said guide means, and adapted to be engaged at its rearward end by the bearing surface of said guide means, and at its forward end by said first disk to exert force on a thread passing

between said disks, an annular adjusting member mounted on said guide means coaxially therewith and with said stud for rotation about said stud and suitably held against axial movement, the rearward end of said annular adjusting member containing a cam surface, the rise and fall of which is axial of said stud, a second member non-rotatably supported for axial movement relative to said stud and having a portion extending parallel with the axis of said stud with its forward end engaging said cam surface of said adjusting member, and a coil spring engaging with abutment means on said stud and with said second member and exerting an axial force on said stud in a direction rearwardly of said guide means, thereby engaging said disks together under springload whereby the pressure between said disks and, hence, the tension of a thread passing therebetween can be adjusted by partial rotation of said annular member to increase or diminish the load exerted by said coil spring.

10. A thread tensioning device as defined in claim 8 and further comprising a second coiled spring surrounding said stud and having a portion extending outwardly therefrom for engagement with a thread passing between said disks, means preventing relative rotation between said spring and stud, and means to vary the angular position of said stud relative to said support means and said annular member to thereby alter the force exerted by said second spring upon a thread engaged therewith.

11. A thread tensioning device as defined in claim 8 and wherein said annular member has a radial flange a portion of which extends beyond the side wall of said support means on which it is mounted thereby facilitating actuation thereof by the machine operator.

12. A thread tensioning device as defined in claim 8 wherein said flange and the adjacent surface of said support means are provided with cooperating indicia representative of the tension exerted upon a thread for any position of said annular member and means to limit rotation of said annular member to less than one revolution.

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